

Formula: $P(n) = P_0(1-r)^n$

$P(n)$: final amount P_0 : initial amount
 r : rate of decay n : number of decay periods

When the base $(1-r)$ is $0 < (1-r) < 1$: decay ←

Read Example 2 page 435 ← when we look at decay
 we look for half life instead of doubling time ←

Ex 2: page 438 # 3

A new car costs \$24000. It loses 18% of its value each year after it is purchased. This type of loss is called depreciation. The value of the car is given by $V(n) = V_0(1-0.18)^n$ where V_0 is the original value of the car, and n is the number of years after the car was purchased.

a) Use the formula to determine how much of the car's initial value is lost after 5 years.

$$= 24000(1-0.18)^5 \quad \therefore \text{the value of the car is } \$8897.76 \text{ after 5 years.}$$

$$= 8897.76$$

b) Use the formula to determine the value of the car after 30 months.

$$= 24000(1-0.18)^{2.5} \quad \frac{30}{12} = 2.5$$

$$= 14613.22$$

\therefore the value of the car after 30 months is \$14613.22.

Ex 3: p 438 # 7

Gels used to change the colour of spotlights each reduce the intensity of the light.

The algebraic model for this situation is $I = 100(0.96)^n$

a) Describe what each part of the equation represents.

I = intensity of light as a % n = # of gels.
 100 = initial intensity

b) State the rate of decay.

$$1 - \underbrace{0.04}_{\text{rate}} = 0.96 \quad \therefore \text{the rate is } 4\%$$

c) Determine the intensity of the spotlight if three gels are used.

\therefore the intensity is approx. 88.5%

d) How many gels would reduce the intensity by more than 75%?

$$\frac{25}{100} = \frac{100(0.96)^n}{100}$$

$$0.25 = (0.96)^n$$

$$= \frac{\log 0.25}{\log 0.96}$$

$$= 33.96$$

Ex 4: p 439 # 9

A hot cup of coffee cools accordingly to the equation $T(t) = 68\left(\frac{1}{2}\right)^{\frac{t}{22}}$ where $T(t)$ is the temperature in degrees Celsius, and t is time in minutes.

a) Which part of the equation indicates that it models exponential decay?

the base of the power is between 1 & 0
& exponent is positive

b) What value of t makes the exponent in the equation equal to 1?

$t = 22$

c) What is the significance of this value?

half-life (22 mins)

d) What was the initial temperature of the coffee?

68°C

e) determine the temperature of the coffee after 40 minutes

$$= 68\left(\frac{1}{2}\right)^{\frac{40}{22}}$$

$$\approx 19.28$$

\therefore the coffee will
be approximately
 19.28°C

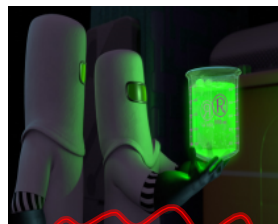
Ex. 5:

The half-life of a radioactive element is 15 days. This means that every 15 days, the amount decreases by 50%. How much of a 200 gram sample will be left after 150 days?

initial x represent time

$$f(x) = 200\left(0.50\right)^{\left(\frac{x}{15}\right)}$$

$$\approx 0.1953$$



$$150 \div 15 =$$

\therefore approx 0.1953g are left
after 150 days.

Hmwk:
p 437 # 5, 8, 10 - 13



"I'm Bob, but my friends call me Rusty
on account of my red hair."